The Rev. D. B. Marsh, D.Sc., Hamilton, Ontario, Canada (proposed by John A. Brashear); and

William Newbold, Tonbridge School, Tonbridge, and 7 Broadwater Down, Tunbridge Wells (proposed by Edward Weldon).

Fifty presents were announced as having been received since the last meeting, including amongst others :—

Twenty-one prints of the Astrographic Chart (Zones $+65°$, $+66°$, $+67°$), presented by the Royal Observatory, Greenwich; two plates of the Harvard photographic map of the sky (to complete series), presented by the Harvard Observatory.

Analyses of Errors of Moon's Longitude for Inequalities of Longer Periods. Methods and Results. By P. H. Cowell.

Up to the present I have confined myself to short-period terms, and I have taken 400 lunar days as the period of analysis. To this there have been two exceptions. In order to properly discuss the terms $\sin g$ and $\sin(2D-g)$ it was necessary to analyse for $\sin(D-g)$; and similarly for terms $g' \pm D$ it was necessary to analyse for $\sin g'$.

Although the analysis for short-period terms will not be finally left in its present state, I have now gone on to terms of longer period. The whole fifty-four years, 1847–1901, has now been taken as a single period of analysis.

The errors to be analysed are shown in Table I.; the Hansen period 1847–1901 has been divided into 48×400 lunar days, or 480 times 40 lunar days, numbered from 891 to 1330 inclusive, in order to permit the Airy period beginning with No. 1. Each period of forty lunar days I refer to as a column, as the original errors have been arranged in columns, each column containing the errors of such observations as occurred in the corresponding forty lunar days. Table I. exhibits the mean error for each column, each individual observation having been corrected for thirteen corrections, as described in previous papers; but the constants for each period of 400 lunar days, which was removed for the purpose of the short-period analyses, have now been restored, and a correction $+1''\cdot3$ applied throughout the whole period, reducing the sum of the 480 quantities here tabulated to $+1''\cdot1$. It is further necessary to state that there were no observations in column 1244—that is to say on line 34, strip 10, of Table I.—and the number there entered has been supplied by inspection.

Mean Error of Moon's Longitude for each of 480 Columns of Forty Lunar Days each in Tenths of a Second of Arc.

Columns

	851 to 890.	891 to 930.	931 to 970.	971 to 1010.	1011 to 1050.	1051 to 1090.	1091 to 1130.	1131 to 1170.	1171 to 1210.	1211 to 1250.	1251 to 1290.	1291 to 1330
	1	2	3	4	5	6	7	8	9	10	11	12
1	+27	− 3	−18	−34	−21	0	+25	− 2	+13	+12	+28	− 1
2	+29	− 8	−30	−56	−19	+ 6	+32	− 8	+15	+17	+27	− 4
3	+29	−14	−21	−60	−11	−10	+30	−34	+12	+ 9	+33	− 6
4	+16	−22	− 3	−61	−18	+ 7	+32	− 5	+20	+19	+22	− 8
5	+16	− 9	−21	−53	−19	− 5	+29	+17	+29	+20	+19	− 8
6	+17	− 6	−12	−61	−23	−17	+16	0	+22	+48	+26	0
7	+21	−23	−17	−65	− 8	− 4	+21	+ 4	+11	+17	+ 2	+ 4
8	+27	−27	−17	−35	−18	+ 5	+21	+11	+12	+32	+17	− 4
9	0	+ 5	−27	−33	−19	+10	+30	+21	+25	+40	+21	− 9
10	+ 4	+ 9	−31	−39	−14	+ 2	+19	− 2	+19	+21	+35	−13
11	+14	+ 1	−28	−37	+ 5	0	+26	+ 3	+28	+30	+16	−14
12	+15	−21	−15	−52	− 4	+24	+20	+ 3	+14	+22	+26	−10
13	+ 1	−10	−21	−52	−10	+19	+29	− 5	+20	+11	+22	−11
14	+ 7	−18	−19	−58	−11	+16	+26	−10	+24	+ 4	+18	−14
15	+16	−17	−33	−53	0	+12	+26	+ 6	+ 7	+14	+ 9	+ 3
16	+24	−23	−31	−61	− 8	+12	+21	+ 6	−14	+ 6	+ 7	+ 5
17	+ 6	−15	−48	−35	0	+16	+24	+19	+ 2	+20	+13	+ 2
18	− 2	−11	−50	−32	−15	+10	+27	+12	+17	+20	+ 9	− 6
19	− 6	−12	−32	−31	− 1	+20	+23	+12	+21	+25	0	− 1
20	+17	− 6	−27	−44	− 9	+10	+25	+ 7	+31	+16	+14	− 2
21	+ 3	− 8	−27	−46	+ 1	+14	+24	+ 6	+35	+19	− 3	−14
22	+ 9	−14	−22	−35	+ 5	+12	+18	− 3	+29	+19	+26	+ 7
23	+13	−18	−27	−48	+10	+ 7	+22	− 1	+32	+ 9	+14	−23
24	+ 2	−20	−24	−34	+ 8	+ 2	+13	− 6	+ 3	+ 5	+ 3	+ 5
25	0	−25	−42	−38	+ 2	+13	+12	+ 1	+ 7	+25	+ 1	− 5
26	0	−16	−46	−28	− 4	+21	+13	+10	+ 3	+15	+10	+ 6
27	−14	−10	−46	−45	− 6	+14	+14	− 1	+17	+22	+10	+ 6
28	−16	−30	−42	−29	+10	+22	+ 5	+ 3	+28	+29	+14	− 5
29	+ 6	−13	−24	−32	+ 7	+25	+15	+ 6	+26	+31	+13	+ 3
30	+ 8	− 7	−40	−35	− 4	+15	+24	+19	+21	+23	+ 1	− 4
31	+ 7	−14	−27	−27	+13	+10	+10	+10	+26	+20	+10	− 4
32	+17	−12	−33	−19	− 8	+17	+ 9	+ 1	+25	+25	− 5	+ 6
33	0	−21	−35	−35	− 3	+28	0	+14	+ 3	+49	− 8	− 5
34	− 7	− 9	−36	−25	−14	+21	− 5	+ 8	+22	[+33]	+ 2	−16
35	− 6	−12	−55	−26	−14	+13	+ 2	+25	+21	+37	− 4	−25
36	−12	0	−46	−29	−13	+12	+ 2	+15	+17	+35	+ 4	− 6
37	−21	−12	−46	−23	−10	+16	+ 3	+16	+23	+30	+ 9	−12
38	−20	−12	−55	−14	+ 6	+17	− 2	+16	+28	+29	+21	− 1
39	− 2	−24	−37	− 9	− 1	+ 8	+11	+18	+33	+23	+ 8	− 5
40	− 5	−15	−28	−32	+ 7	+22	− 3	+13	+25	+27	− 5	+12

Taking $\pm 1''\cdot 7$ as the probable error of a single observation, the quantities in Table I. will be subject to an accidental error of $\pm 0''\cdot 5$. This is approximately the accidental error of a star.

It will be noticed that I refer to the columns of Table I. as strips. This is partly because I use the word "column" as just explained to denote forty lunar days and partly with reference to my method of analysis, which I now explain in detail for the argument E−J, a Jupiter term. The columns of Table I. are used by me in MS. written on separate strips of paper, 2 inches wide, with the numbers 1–40 printed down them. A strip blank, except that it is marked with the consecutive numerals, is then placed on the table, and column 1091, that is to say, the first entry of the seventh strip, is placed in a line with the "1" on the blank strip; column 1092 will then fall opposite the "2," and so on. Column 851, the first of the first strip, is placed opposite the "2" of the blank strip; and the first column of the ninth strip opposite the "4" of the blank strip, the complete arrangement being indicated by the annexed table:—

Column.	Number of Blank Strip.	Column.	Number of Blank Strip.
851	2	1091	1
891	13	1131	12
931	24	1171	4
971	16	1211	15
1011	27	1251	7
1051	19	1291	18

The arrangement is so contrived that entries opposite the same number of the blank strip correspond as nearly as possible to the same value of the argument E−J, and may properly be added for an E−J analysis. Moreover, the value of the argument E−J for any line is found by multiplying the number on the blank strip by the "unit," an exact fraction if possible of 360° or a low multiple of it. It is clearly necessary that the "unit" shall be a close approximation to the movement of E−J in 40 lunar days. In the present instance $\frac{3 \times 360^\circ}{29}$ has been taken as the unit, so that the values of E−J recur every twenty-ninth line of the blank strip. I postpone an account of the calculations justifying the precepts of the foregoing table until the rest of the analysis has been described. The numbers on the strips are then added horizontally and the results shown in the following table:—

No. on Blank Strip.	Sum.	No. of Quantities added.	No. on Blank Strip.	Sum.	No. of Quantities added.	No. on Blank Strip.	Sum.	No. of Quantities added.
1	+ 25	1	30	− 18	12	59	−49	2
2	+ 59	2	31	− 30	12	60	−60	2
3	+ 59	2	32	+ 6	12	61	−69	2
4	+ 74	3	33	+ 8	12	62	−50	2
5	+ 60	3	34	− 27	12	63	−38	2
6	+ 44	3	35	− 40	12	64	+ 6	1
7	+ 86	4	36	− 72	12	65	− 1	1
8	+ 98	4	37	− 14	12	66	+ 7	1
9	+112	4	38	+108	12	...	...	...
10	+ 52	4	39	− 36	12	...	...	...
11	+ 61	4	40	− 97	12	...	...	...
12	+ 83	5	41	− 19	11	...	...	...
13	+ 54	6	42	− 19	10	...	...	...
14	+ 30	6	43	+ 15	10	...	...	...

No. on Blank Strip.	Sum.	No. of Quantities added.	No. on Blank Strip.	Sum.	No. of Quantities added.
29	−64	12	58	−41	3
28	−80	12	57	− 3	4
27	−65	12	56	−27	4
26	+ 7	11	55	−43	5
25	−24	11	54	+ 1	6
24	+ 1	11	53	−30	6
23	+79	10	52	−41	7
22	+27	10	51	−38	8
21	+ 8	10	50	−11	8
20	+28	10	49	− 4	8
19	−28	10	48	−12	8
18	+22	9	47	+31	8
17	+32	8	46	− 2	9
16	+70	8	45	−34	9
15	+61	7	44	− 1	9

Owing to the recurrence every twenty-ninth line, the entries for Nos. 1, 30, 59 may properly be added. Moreover, since the sum of the values of E—J for the pth and $29-p$th lines is 360°, the values of cos (E—J) are the same throughout the whole of a horizontal line of the preceding table; while the values of sin (E—J) are the same numerically, but the last two are of changed sign.

Hence we obtain the following table, sufficiently explained by its headings :—

Multiples of Unit of $\frac{360^\circ \times 3}{29}$	Value of E—J.	Sum for Sine Analysis.	100 × sin E—J.	Product.	Sum for Cosine Analysis	100 × cos (E—J).	Product.
0	0·0	...	0	...	−105	+100	−105
1	37·2	+41	+ 60	+25	−125	+ 80	−100
2	74·5	+61	+ 96	+59	−123	+ 27	− 33
3	111·7	+32	+ 93	+30	− 40	− 37	+ 15
4	149·0	+55	+ 51	+28	+ 9	− 86	− 8
5	186·2	+24	− 11	− 3	− 34	− 99	+ 34
6	223·4	−28	− 69	+19	+ 48	− 73	− 35
7	260·7	+24	− 99	−24	+ 2	− 16	0
8	297·9	+94	− 88	−83	+ 88	+ 47	+ 41
9	335·2	−20	− 42	+ 8	+ 28	+ 91	+ 25
10	12·4	+56	+ 21	+12	− 24	+ 98	− 23
11	49·6	−89	+ 76	−67	+ 17	+ 65	+ 11
12	86·9	+34	+100	+34	+ 94	+ 5	+ 5
13	124·1	− 1	+ 83	− 1	+ 71	− 56	− 40
14	161·4	−15	+ 32	− 5	+105	− 95	−100
Sums	...	...	...	+32	+ 11	...	−313

In the last line the sum +11 should obviously be the total of the entries of Table I., which, as previously noted, is +11 ; this checks nearly all the arithmetic. The other two sums must be divided by

$$\Sigma \sin^2 (E-J) \text{ and } \Sigma \cos^2 (E-J)$$

respectively : each of these quantities is 240. Dividing, however, by 2400 we get the result expressed in seconds of arc.

It is as follows :—

Hansen's tabular places exhibit an excess over the observations of

$$+0''{\cdot}01 \sin (E-J) - 0''{\cdot}13 \cos (E-J).$$

Both these terms may be discarded as accidental.

Before proceeding to give the results of similar analyses, I must explain the calculation of the table of precepts for the arrangement of the twelve strips for the additions.

From the table published at the end of my paper in the *Monthly Notices* for March I obtain $E-J = 21^\circ{\cdot}4980$ at the middle of my forty-fourth period of analysis, and its movement in forty lunar days $= 37^\circ{\cdot}36605$.

The latter quantity suggested the unit

$$\frac{3 \times 360^\circ}{29} = 37^\circ{\cdot}24$$

and in terms of this unit $E-J = 1{\cdot}73178 \div 3$ at the middle of the forty-fourth period of analysis and the movement in forty lunar days is $3{\cdot}010044 \div 3$. It is convenient to keep the "3" in evidence in the manner indicated.

The interval from the middle of the forty-fourth period of analysis to the middle of the first strip is 435 columns of forty lunar days, and the movement in this time is

$$1309{\cdot}36914 \div 3,$$

or discarding multiples of 29

$$4{\cdot}36914 \div 3.$$

Hence the value for the middle of strip 1 (that is to say, strip 1, line $20\frac{1}{2}$) is

$$6{\cdot}10092 \div 3.$$

It is convenient to add 58 to this, making $64{\cdot}10092$, so that on division by 3 the fraction lies between $\frac{1}{3}$ and $\frac{2}{3}$. Thus, for strip 1, line $20\frac{1}{2}$ $E-J = 21{\cdot}37$ units. Therefore, strip 1, line 1, or column 851, $E-J = 2$ units.

Continuing, in one strip or forty columns, the movement of $E-J = 120{\cdot}40 \div 3$.

Adding ·40 to ·10 (from $64{\cdot}10092$ above), the unit is unchanged, the division by 3 leaves the fraction between $\frac{1}{3}$ and $\frac{2}{3}$; there is no break in continuity, and column 891 corresponds to unit $2+40-29=13$.

Adding another ·40, making ·90, there is still no break of continuity, and column 931 corresponds to $13+40-29=24$.

Adding another ·40, making $1{\cdot}30$, we now have to add 29, making $0{\cdot}30$ on casting out threes.

A discontinuity of 10 is therefore introduced, and column 971 corresponds to

$$24+40-58+10=16$$

and so on.

It is clear that since $360^\circ = 9\frac{2}{3}$ units, the discontinuity of 10 units is really a discontinuity of $\frac{1}{3}$ unit; and at the middle of each strip the true and adopted value of $E-J$ never differ by more than $\frac{1}{6}$ unit or $6^\circ{\cdot}2$.

Almost every figure used in the E—J analysis has now been set down, and it will be seen that the analysis for fifty-four years is reduced to a quite short computation when once the method has been reduced to routine. I have carried through the necessary computations for four different arguments in one day.

The following table gives the outline of the various analyses performed :—

Argument	g'	$g'-\omega+\omega'$	$(2g'-\omega+\omega')$	$(2g'+2\omega')$	(V−E)	(2V−3E+85°)	(E−J)
Unit	$\frac{360^\circ}{9}$	$\frac{360^\circ}{10}$	$\frac{3\times360^\circ}{14}$	$\frac{5\times360^\circ}{21}$	$\frac{360^\circ}{14}$	$\frac{360^\circ}{35}$	$\frac{3\times360^\circ}{29}$
Movement in 40 lunar days							
in degrees	40°·80584	36°·19540	77°·00524	86°·00040	25°·52522	10°·24425	37°·36605
in units	1·020146	1·005428	2·994648÷3	5·016690÷5	0·992647	0·995969	3·010044÷3
Value at middle of 44th period of analysis							
in degrees	4°·1375	57°·8240	61°·9615	141°·1374	47°·5763	76°·5091	21°·4980
in units	0·10344	1·60622	2·40961÷3	8·23301÷5	1·85019	7·43848	1·73178÷3
Value in units corresponding to columns							
851	1	9	5	7	8	1	2
891	6	10	12	1	6	6	13
931	2	10	10	20	4	11	24
971	7	10	8	14	1	16	16
1011	3	10	6	8	13	21	27
1051	7	1	4	6	11	25	19
1091	3	1	11	21	8	30	1
1131	8	1	9	15	6	35	12
1171	4	1	7	13	4	5	4
1211	9	1	5	7	2	10	15
1251	4	2	12	1	13	15	7
1291	9	2	10	20	11	19	18
tab−obs. apparent coefficients of							
sin (arg.)	−0″·35	−0″·09	+0″·02	+0″·25	−0″·34	+0″·29	+0″·01
cos (arg.)	−0·28	+0·32	−0·08	−0·02	−0·02	0·00	−0·13
sin (twice arg.)	+0·05	−0·17	+0·20	−0·03	+0·10		
cos (twice arg.)	−0·04	+0·01	−0·04	−0·06	−0·01		

The arguments $\omega-\omega'$, ☊, 2M−E+49° move so slowly that 5×40 lunar days were taken as the unit of time, and the following table was formed from Table I. by throwing two columns into one, and adding five lines at a time. Each entry is therefore the mean for 200 lunar days expressed in units of 0″·02.

	A.	B	C.	D.	E.	F.
1	+117	− 93	−88	+148	+ 89	+129
2	+ 69	−104	−82	+107	+ 89	+101
3	+ 53	−116	−20	+127	+ 93	+ 91
4	+ 39	−188	−33	+120	+ 57	+ 43
5	+ 27	−142	+26	+ 89	+106	+ 41
6	− 16	−198	+ 3	+ 71	+ 95	+ 48
7	+ 11	−186	−26	+ 16	+ 97	− 5
8	− 60	−212	−11	+ 11	+126	+ 37
9	− 56	−264	− 2	− 32	+ 77	− 27
10	− 42	−233	− 4	+ 34	+158	− 22
11	− 65	−252	+71	− 3	+ 81	− 46
12	− 67	−203	+68	+ 56	+ 87	− 2
13	− 85	−201	+48	− 3	+ 77	− 30
14	− 76	−169	+97	+ 37	+120	+ 6
15	− 68	−132	+89	+ 58	+164	− 44
16	− 63	−107	+75	+ 78	+144	− 12

The same plan of analysis was adopted, and the six strips are referred to by the letters A to F. The outline is given in the tables below :—

Argument.	$2M-E+49^\circ$.	$\omega-\omega'$.	$-\Omega$.	2ω.
Unit	$\frac{360^\circ}{28}$	$\frac{360^\circ}{16}$	$\frac{360^\circ}{33}$	$\frac{3\times360^\circ}{16}$
Movement in 200 lunar days				
in degrees	$12^\circ{\cdot}92915$	$23^\circ{\cdot}05215$	$10^\circ{\cdot}96205$	$68^\circ{\cdot}0478$
in units	1·005601	1·024540	1·004855	3·02435÷3
Value at middle of 44th period of analysis				
in degrees	$54^\circ{\cdot}4667$	$306^\circ{\cdot}3135$	$326^\circ{\cdot}9251$	$25^\circ{\cdot}4894$
in units	4·2363	13·6139	29·9681	1·1329÷3
Value in units corresponding to				
A 1	4	3	15	2
B 1	20	4	31	13
C 1	8	4	14	13
D 1	25	5	30	13
E 1	13	5	13	8
F 1	1	5	29	8
Tab. − obs. apparent coefficients of				
sin (arg.)	$-0''{\cdot}33$	$+0''{\cdot}60$	$-1''{\cdot}18$	$+0''{\cdot}10$
cos (arg.)	−0·06	−0·31	−0·28	−0·15
sin (twice arg.)	−0·01	0·00	...	...
cos (twice arg.)	−0·05	−0·03	...	...

It should be noticed that $-\Omega$ and not Ω has been taken as the argument.

All the long-period analyses at present completed have now been exhibited. It is clear that many of the coefficients obtained may be treated as accidental. Further it is to be remembered that all coefficients given are "apparent" (see *Monthly Notices*, March, p. 413). I proceed now to the explanations. The quantities are always spoken of in the sense *tabular* minus *observed*

(i.) $-0''\cdot35 \sin g'$

On p. 419 I found from a former analysis

$$+0''\cdot24 \sin (g'-D)-0''\cdot83 \sin g'+0''\cdot81 \sin (g'+D)$$

I have subsequently applied the correction $+0''\cdot55 \sin g'$, whose apparent effect, according to the ideas of p. 413, will be

$$+0''\cdot55 \sin g'-0''\cdot27 \sin (g'-D)-0''\cdot27 \sin (g'+D)$$

We ought now to have

$-0''\cdot28 \sin g'+0''\cdot54 \sin (g'+D)$. The former term is here verified to within $0''\cdot07$. It is clearly the apparent effect of the latter term which alone is real.

(ii.) $-0''\cdot28 \cos g'$. On p. 419 $-0''\cdot33 \cos g'+0''\cdot46 \cos (g+D)$ was found. Again the latter term is alone real.

We have therefore real terms

$$+0''\cdot54 \sin (g+\omega-\omega')+0''\cdot46 \cos (g+\omega-\omega')$$

As I said on p. 420, the true argument may be $g+\varpi$, or the *Venus* term $g+2\varpi+3V-5E$, and it is necessary to wait till the Airy period is reduced. My present supposition is—but it is no more than a supposition—that the term is partly $+0''\cdot4 \cos (g+\varpi)$, with possibly a correction to the coefficients of $\sin (g+\omega-\omega')$ and the *Venus* term. A term $+0''\cdot4 \cos (g+\varpi)$ might arise in this way. Suppose the observed declinations on the average $1''$ too small. Remove the constant correction $-1''$ that Hansen applies to all latitudes. If, then, $+1''$ be applied to all tabular latitudes, and $+1''$ to all observed declinations, the difference "tabular *minus* observed" longitude receives a correction $-0''\cdot4 \cos (g+\varpi)$, which would cancel part of the terms that result from my analysis of the errors. Errors of refraction or division error may account for part of the supposed error of $1''$ in the observed declinations, but not, I think, for all of it. The outstanding part may possibly be due to an erroneous parallax of the Moon, which is, as far as I can judge, a not very accurately determined quantity.

(iii.) $-0''\cdot09 \sin(g-D)$ must be taken with $+0''\cdot17 \sin g$, (see p. 419, l. 13). The latter is the real term, the former its apparent effect.

(iv.) $+0''\cdot32 \cos(g-D)$. On p. 417 I gave $+0''\cdot34 \cos(g-D)$. It there appears as if this is the real term, and $\cos(g-2D)$, $\cos g$ merely the apparent terms. Of course $\cos(g-D)$ cannot be exactly the real term, but there may possibly be some term with an argument of nearly the same speed.

(v.) $-0''\cdot17 \sin(2g'-2\omega+2\omega')$. This is for the most part the apparent effect on an error of $0''\cdot22$ in the coefficient of the allied term $(-g-g'+\omega-\omega')$.

(vi.) $+0''\cdot20 \sin(4g-2\omega+2\omega')$. This term is nearly what we might expect. Hansen's tabular places contain the term $-0''\cdot134 \sin(4g'-2\omega+2\omega')$ (see *Monthly Notices*, January, p. 164), and the true coefficient is $-0''\cdot28$ (see Newcomb's Transformation, *Astron. Papers*, *Amer. Eph.* vol. i.).

(vii.) $+0''\cdot25 \sin(2g'+2\omega')$. This term is confirmed in the same way as (vi.). The tabular coefficient is $-54''\cdot98$, and the true $-55''\cdot2$.

(viii.) $-0''\cdot34 \sin(V-E)$.

Hansen's term is $-1''\cdot10 \sin(V-E)$
Radau gives $-0''\cdot86 \sin(V-E)$

Radau is therefore more nearly right, and is within the possible errors of observation.

(ix.) $+0''\cdot10 \sin(2V-2E)$. Hansen gives $+0''\cdot43$, Radau $+0''\cdot28$. Again Radau's term seems the better.

(x.) $+0''\cdot29 \sin(2V-3E+85°)$. Hansen gives no term. Radau gives $-0''\cdot35$, and is thus confirmed.

(xi.) $-0''\cdot33 \sin(2M-E+49°)$. This inequality is entirely masked by the term in ☊, which separates from it at the rate of one revolution a century. It follows, therefore, that fifty-four years is inadequate for a thorough discussion. In fact, if the terms subsequently found $-1''\cdot18 \sin(-☊) -0''\cdot28 \cos(-☊)$ be taken out and the analysis repeated, the present term would approximately change sign. About 1875 the two arguments $2M-E+49°$ and $-☊$ are equal; for a short time $-1''\cdot18 \sin(-☊)$ is indistinguishable from $-1''\cdot18 \sin(2M-E+49°)$, and although this effect is reduced by extending the analysis over fifty years, it still comes in with about two-thirds of its full effect, changing the sign as I have said.

Of course, if another century of observations were not so soon to be available it might be worth while to try and separate the two terms. Each coefficient could, however, only be obtained with a probable error several times as large as the probable error in ordinary cases. The process would bear some analogy to the separation of the parallactic inequality from the semi-diameter, or the cos D term from the mean error.

(xii.) $+0''\cdot60 \sin(\omega-\omega')$.

Hansen's tables give	$+1''\cdot58$
Hansen's theory gives	$+1''\cdot33$
Delaunay gives	$+0''\cdot87$

The evidence of the observations is therefore in favour of Delaunay.

(xiii.) I am unable to explain $-0''\cdot31 \cos(\omega-\omega')$.

(xiv.) $-1''\cdot18 \sin(-☊) - 0''\cdot28 \cos(-☊)$. The coefficients are uncertain to about $0''\cdot3$ on account of the *Mars* term just discussed. It is clear, however, that Hansen's figure of Earth terms require considerable diminution. On the other hand, the term in $\sin ☊ \cos g$ apparently requires a large increase. Hansen's tables are equivalent to $+0''\cdot59 \sin ☊ \cos g$; I have already applied $+0''\cdot445 \sin ☊ \cos g$, bringing the coefficient up to $+1''\cdot04$ in accordance with Hill's calculations. On analysing the coefficients of $\cos g$ and $\sin g$, given on pp. 415, 416 (last two columns), I obtain

$$(-0''\cdot22 \sin ☊ + 0''\cdot29 \cos ☊) \cos g$$
$$+ (+0''\cdot13 \sin ☊ + 0''\cdot05 \cos ☊) \sin g$$

The coefficient of $\sin ☊ \cos g$ should, therefore, apparently be $+1''\cdot26$, or about double Hansen's value.

I ought to add that any at present undiscovered term with a period between fourteen years and twenty-five years (a very wide range) will affect an analysis for ☊ based upon fifty-four years. This range will shortly be considerably reduced by taking the Airy period into the discussion. As no two discussions have hitherto given the same coefficient of cos ☊, I suspect the existence of such an undiscovered term.

The Parallactic Inequality: A Reply. By P. H. Cowell, M.A.

On p. 567 of the present volume of the *Monthly Notices* Professor Turner writes: "If the solar parallax as determined from observations of the Moon is affected with an entirely unknown systematic error, then it is a pity to publish the result." I thought I had made it clear on p. 96, in a passage that Professor Turner has quoted on p. 406, that I saw no means of separating the errors of observation from the error of tabular parallactic inequality, and that my results were given on the assumption that the errors of observation were zero. I see no objection to publishing a result if its limitations are clearly set down.

I said last December, and I still say now, that I am unable to determine how much of the coefficient of the parallactic in-